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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/836,674	04/16/2001	Sven Lindfors	SEPP11.001AUS	9836

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EXAMINER	
SONG, MATTHEW J	
ART UNIT	**PAPER NUMBER**
1765	11

DATE MAILED: 04/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)
	09/836,674	LINDFORS, SVEN
	Examiner	Art Unit
	Matthew J Song	1765

-- The MAILING DATE of this communication appears on the cover sh et with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 January 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) *27-34* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-18 and 22-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Suntola et al (US 6,015,590).

Suntola et al discloses an apparatus for ALE comprising four reaction chambers **13** having substrates **12** onto which thins films are grown using the ALE process, where vapor phase reactants are feed into a reaction space in the form of vapor phase pulses repeatedly and alternately and evacuating the reaction space between successive pulses (claim 1 and col 3, ln 1-67). Suntola et al also discloses a reactant inflow channel **7** for metallic reactants such as $TiCl_4$, $ZnCl_2$, hydrogen sulfide and sulfur (col 4, ln 45-60, col 8, ln 30-67 and Fig 1). Suntola et al also teaches starting materials are isolated from each other thus preventing their pre-mature mutual reactions and such reactions occur in the gas phases resulting in a CVD thin film (col 7, ln 5-67). Suntola et al also teaches a design target of less than 1% of residual components of a preceding vapor phase reactant pulse remaining at the infeed of the next pulse and the reaction space can be purged to less than 1 ppm of reactant residues from the preceding pulse (col 5, ln 10-35 and col 3, ln 25-40). Suntola et al also discloses the "reaction space" includes the space in which the substrate is located and the gas inflow channels communicating with the reaction chamber (col 4, ln 25-50).

Referring to claim 1, Suntola et al discloses feeding a vapor phase pulse, purging the reactor to less than 1% of residual components and feeding in a second vapor phase pulse, as applicant. Suntola et al is silent to a reaction product is formed. This is inherent to Suntola et al because Suntola et al teaches a similar residual amount of first reactant, as applicant (note instant claim 22), and similar reactants, as applicant (note pg 7 of the instant specification); therefore a reaction product is inherently formed.

Referring to claim 2, Suntola et al discloses a vapor phase reactant pulse (col 9, ln 10-20).

Referring to claim 3, Suntola et al discloses molecules adsorbed on the inner walls of the system (col 8, ln 10-17).

Referring to claim 4, Suntola et al discloses a inflow channel **7**, this reads on applicant's pre-reactor, upstream from the reaction chambers **13**, this reads on applicant's second reaction chamber.

Referring to claim 5-6, Suntola et al discloses an ALE process, this reads on applicant's ALD, for forming a thin film on substrates **12** placed in the reaction chambers **13**.

Referring to claim 7, Suntola et al discloses the piping, this reads on applicant's pre-reactor, is evacuated such that the residual vapor phase reactant is less than 1% (col 5, ln 10-35).

Referring to claim 9, Suntola et al discloses feeding vapor phase reactants alternately (claim 1).

Referring to claim 10, Suntola et al discloses feeding a vapor phase pulse, purging the reactor to less than 1% of residual components and feeding in a second vapor phase pulse, as applicant. Suntola et al is silent to a reaction product is formed. This is inherent to Suntola et al because Suntola et al teaches a similar residual amount of first reactant, as applicant (note instant

claim 22), and similar reactants, as applicant (note pg 7 of the instant specification); therefore a reaction product is inherently formed.

Referring to claim 11, Suntola et al discloses a plurality of vapor phase reactants (claim 1).

Referring to claim 12, 16 and 28, Suntola et al discloses feeding a vapor phase pulse, purging the reactor to less than 1% of residual components and feeding in a second vapor phase pulse and the temperature of the reactor and pre-reactor are the same temperature, as applicant. Suntola et al is silent to the second vapor phase reactant reacts with the residual first vapor phase reactant under conditions conducive to chemical vapor deposition. This is inherent to Suntola et al because Suntola et al teaches a similar residual amount of first reactant, as applicant (note instant claim 22), and similar reactants, as applicant (note pg 7 of the instant specification); therefore a reaction product is inherently formed by CVD conditions.

Referring to claim 13, Suntola et al discloses the pre-reactor 7 is placed immediately adjacent the second reactor **13** (Fig 1).

Referring to claim 14, Suntola et al discloses an inflow channel **28** for starting material of group B and an inflow channel **29** for a starting material of group A (col 10, ln 1-30 and Fig 2).

Referring to claim 15, Suntola et al discloses the inflow channels and intermixing in the inflow slit, this reads on applicant's pre-reactor (col 10, ln 40-55).

Referring to claim 17, Suntola et al discloses feeding a vapor phase pulse, purging the reactor to less than 1% of residual components and feeding in a second vapor phase pulse and the temperature of the reactor and pre-reactor are the same temperature, as applicant. Suntola et al is silent to the second vapor phase reactant reacts with the residual first vapor phase reactant to

form a solid product so as to deplete the residual first vapor phase reactant. This is inherent to Suntola et al because Suntola et al teaches a similar residual amount of first reactant, as applicant (note instant claim 22), and similar reactants, as applicant (note pg 7 of the instant specification); therefore a reaction product is inherently formed by CVD conditions

Referring to claim 18, Suntola et al discloses the "reaction space" includes the reaction chamber and the inflow piping (col 4, ln 29-45); therefore the "reaction space" would inherently be operated at the same temperature for ALE deposition.

Referring to claim 22, Suntola et al discloses less than 1 ppm (col 5, ln 30-31).

Referring to claim 23, Suntola et al discloses less than 1% (col 5, ln 25-26 and Claim 1).

Referring to claim 24, Suntola et al discloses the reaction space is purged with an inactive gas during the interval between the reactant pulses (col 5, ln 10-30).

Referring to claim 25, Suntola et al discloses the reaction space is purged with an inactive gas and evacuated (col 5, ln 10-30).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suntola et al (US 6,015,590) in view of Soininen et al (US 5,855,680).

Suntola et al discloses all of the limitations of claim 19, as discussed previously, except the reaction product is removed from the reaction chamber separately from the thin film.

In an apparatus for growing thin films, Soininen et al teaches in an atomic layer epitaxy (ALE) method points where undesired film growth occurs must be subjected at regular intervals to surface cleaning from grown films, this reads on applicant's reaction product is removed from the reaction chamber separately from the thin film, or the contaminated parts must be replaced by new ones (col 8, ln 35-50). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Suntola et al with Soininen et al because cleaning reduces part replacement.

Referring to claim 20, the combination of Suntola et al and Soininen et al teaches undesired film growth occurs on other surfaces of a reaction chamber which can be replaced, this reads on applicant's discardable substrate.

Referring to claim 21, the combination of Suntola et al and Soininen et al teaches cleaning the undesired deposition.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suntola et al (US 6,015,590) in view of Mochizuki et al (US 5,166,092).

Suntola et al discloses all of the limitations of claim 26, as discussed previously, except the pressure of the reaction chamber is in the range of 1 to 100 mbar.

In a method of growing a compound film by atomic layer epitaxy, note entire reference, Mochizuki et al teaches a pressure dependency of the thickness of a grown GaAs layer per material supply cycle and a satisfactory GaAs molecular layer is obtainable in a pressure range

of approximately 7 Torr to 60 Torr (9.3 to 80 mbar) (col 6, ln 65 to col 7, ln 5 and Fig 10). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Suntola et al with Mochizuki et al's pressure to produce a satisfactory GaAs molecular layer.

The combination of Suntola et al and Mochizuki et al teach a pressure range of 9.3 to 80 mbar. The combination of Suntola et al and Mochizuki et al does not teach a pressure range of 1 to 100 mbar. Overlapping ranges are held to be obvious (MPEP 2144.05).

Response to Amendment

The declaration filed on 1/23/2003 under 37 CFR 1.131 is sufficient to overcome the Sneh et al reference.

Response to Arguments

Applicant's arguments with respect to claims 1-34 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the

organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS
April 1, 2003

BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
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